

**THE ORDERS OF OSTROPOMYCETIDAE  
(LECANOROMYCETES, ASCOMYCOTA): RECOGNITION OF  
SARRAMEANALES AND TRAPELIALES WITH A REQUEST  
TO RETAIN PERTUSARIALES OVER AGYRIALES**

**Brendan P. Hodkinson**

International Plant Science Center, The New York Botanical Garden,  
Bronx, NY 10458-5126, USA  
bhodkinson@nybg.org

**James C. Lendemer**

Institute of Systematic Botany, The New York Botanical Garden,  
Bronx, NY 10458-5126, USA  
jlendemer@nybg.org

**ABSTRACT**

Recent molecular phylogenetic analyses have shown that *Agyrium rufum*, the type species of *Agyrium*, is unrelated to Trapeliaceae and closely related to *Pertusaria* s. str. As such, the ordinal names Agyriales and Pertusariales were placed in synonymy, with preference given to continue the use of the older name Agyriales rather than Pertusariales. We argue that the name Pertusariales should be retained in favor of Agyriales. We also formally describe a new order, Trapeliales, to accommodate the discrete group of taxa that was previously classified in Agyriales but is actually distinct from that taxon in its current circumscription. Additionally, the molecularly and morphologically distinct order Sarrameanales is defined. *Phytologia* 93(3):407-412 (December 1, 2011)

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Recently the authors began updating the synoptic higher level taxonomic framework of lichenized fungi that is used to organize the lichen herbarium of the New York Botanical Garden (NY; Hodkinson, in press). Such updates are intended to keep the herbarium organized in a phylogenetic framework that reflects current taxonomic concepts.

However, they also offer useful opportunities to compare and synthesize the accumulated results of recent studies based on both molecular and non-molecular datasets. While preparing the current scheme, we could not find a source of valid publication for an ordinal name encompassing the family Sarrameanaceae Hafellner (= *Loxosporaceae* Kalb & Staiger), although “*Loxosporales?*” was used by Miadlikowska et al. (2006). Since doubt was expressed, this does not constitute valid publication, and we could not find any definitive use of an ordinal name in subsequent publications. However, members of the genus *Loxospora* (contained within Sarrameanaceae) are well supported by several large-scale phylogenetic analyses as being distinct and separate from the clade containing all other defined orders within Ostropomycetidae (Miadlikowska et al. 2006; Schoch et al. 2009) and therefore this clade warrants recognition at the ordinal rank.

In our review we also found that Lumbsch et al. (2007a) reduced Agyriales to the type family (Agyriaceae) and genus (*Agyrium*) based on the fact that *Agyrium rufum* (Pers.) Fr. (the type species of the *Agyrium*) did not show phylogenetic affinities to Trapeliaceae, a family comprising all of the other genera previously included in the order. In the same work, Trapeliaceae was moved to the order Baeomycetales, based on analyses presented by the authors showing a well-supported sister relationship between Trapeliaceae and a clade correlated with Baeomycetales.<sup>1</sup> The sister relationship that was inferred stands in contrast to some analyses which place Trapeliaceae in a position where it is strongly supported by Bayesian inference as neither being sister to nor within Baeomycetales (e.g., Kauff & Lutzoni 2002; Lutzoni et al. 2004; Miadlikowska et al. 2006). Regardless of which reconstruction best reflects the evolutionary history of the organisms, all of the analyses for which we have examined the results put members of Trapeliaceae in a clade that is molecularly and morphologically distinct from Baeomycetales. In light of the current situation, we formally establish Trapeliales as a new order to accommodate the family Trapeliaceae. The genera of Trapeliaceae that form the core of the

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<sup>1</sup> Note that the genus *Ainoa* Lumbsch & I. Schmitt, which is often treated with Trapeliaceae, occupies an uncertain taxonomic position, but is inferred to be closely affiliated with Baeomycetales (Lumbsch et al. 2007a, 2007b; Schmitt et al. 2010).

family in large-scale molecular phylogenetic studies are *Placopsis* (Nyl.) Linds., *Placynthiella* Elenk., *Orceolina* Hertel, *Rimularia* Nyl., *Trapelia* M. Choisy, and *Trapeliopsis* Hertel & Gotth. Schneid. (Schmitt et al. 2003; Lumbsch et al. 2007a, 2007b, Miadlikowska et al. 2006), while the genera *Aspiciliopsis* (Müll. Arg.) M. Choisy, *Lignoscripta* B.D. Ryan, *Lithographa* Nyl., *Ptychographa* Nyl. and *Xylographa* (Fr.) Fr. have been shown otherwise to have molecular affinities to the core clade of the family (Spribille, pers. comm.; Lumbsch et al. 2001; Schmitt et al. 2003); additionally, the genera *Amylora* Rambold, *Coppinsia* Lumbsch & Heibel and *Sarea* Fr.<sup>2</sup> are provisionally placed here based on morphology.

Another work that recently came to our attention was Schmitt et al.'s (2010) paper on *Gyalectaria*, in which Agyriales was put into synonymy with Pertusariales. The Schmitt et al. (2010) publication revealed a close relationship between *Agyrium rufum* (Pers.) Fr. and *Pertusaria* DC. s. str. (typified by *P. communis* DC. = *P. pertusa* (L.) Tuck.). This relationship is surprising because *A. rufum* is a non-lichenized saprophytic fungus that does not morphologically resemble *Pertusaria* s. str. Nonetheless, the relationship was well supported by both maximum likelihood and Bayesian methods of phylogenetic inference, and based on sequence data from four genes and two samples. *Pertusaria* DC. is the type genus of the family Pertusariaceae Körb., which is the type of the order Pertusariales M. Choisy ex D. Hawksw. As a consequence of the recognition that *A. rufum* is strongly supported as sister to members of *Pertusaria* s. str., Schmitt et al. (2010) concluded that the names Agyriales and Pertusariales should be placed in synonymy. When Schmitt et al. (2010) placed the two orders in synonymy, they adopted the name Agyriales for this group on the basis of priority. However, the principal of priority does not apply above the rank of family and, thus, either name could have been adopted (McNeill et al. 2006: Art. 11.10). It is recommended that, when working with names above the rank of family, authors should follow priority (McNeill et al. 2006: Rec. 16B); however, we believe that this

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<sup>2</sup> Although sequences generated by Reeb et al. (2004) indicate that *Sarea* does not belong to Ostropomycetidae, and may be closer to clades currently placed in Leotiomycetes, this change is not reflected in the current outline (Lumbsch & Huhndorf 2010); since these sequences could potentially be derived from contaminants, we leave the genus in Trapeliaceae provisionally.

situation presents a clear case in which the name Pertusariales should be retained. The reason for this is that Pertusariales, excluding *Agyrium*, comprises a group containing hundreds of species of lichenized fungi that, for the most part, have historically been grouped together because of their distinctive morphological gestalt. Conversely, the name Agyriales has previously been applied to an incorrectly circumscribed group including the family Trapeliaceae, and was originally applied to a large heterogeneous group of organisms from across the fungal tree of life. In a strict sense, the name Agyriales applies to a small genus of less than two dozen species of non-lichenized saprophytic fungi, only one of which, the type, has been sequenced to date and included in molecular phylogenetic analyses (Schmitt et al. 2010). We assert that the name Pertusariales should be retained in the interest of stability to preserve the continued use of a name for a highly speciose group that has become widespread and has proliferated throughout the lichenological literature.

### TAXONOMIC SECTION

Note: The lower-level composition of each taxon is given only if it differs from that shown by Lumbsch & Huhndorf (2010).

Ostropomycetidae Reeb, Lutzoni & Cl. Roux

    Baeomycetales Lumbsch, Huhndorf & Lutzoni

        Anamylopsoraceae Lumbsch & Lunke

        Baeomycetaceae Dumort.

Ostropales Nannf.

Pertusariales M. Choisy *ex* D. Hawksw. & O.E. Erikss.

    = Agyriales Clem. & Shear

        Agyriaceae Corda

        Coccotremataceae Henssen *ex* J.C. David & D. Hawksw.

        Icmadophilaceae Triebel

        Megasporaceae Lumbsch, Feige & K. Schmitz

        Ochrolechiaceae R.C. Harris *ex* Lumbsch & I. Schmitt

        Pertusariaceae Körb. *ex* Körb.

Sarrameanales Hodkinson & Lendemer ord. nov.

    Sarrameanaceae Hafellner [Type family]

        = Loxosporaceae Kalb & Staiger

Trapeliales Hodkinson & Lendemer ord. nov.

    Trapeliaceae M. Choisy *ex* Hertel [Type family]

Families incertae sedis

Arctomiaceae Th. Fr.

?Arthrorhaphidaceae Poelt & Hafellner

Hymeneliaceae Körb.

Protothelenellaceae Vězda, H. Mayrhofer & Poelt

Schaereriaceae Hafellner

Thelenellaceae H. Mayrhofer

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